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EXAMINER	
WANG, JIN CHENG	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/624,385	Applicant(s) KATAYAMA ET AL.	
	Examiner Jin-Cheng Wang	Art Unit 2672	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5-8,11-13 and 26-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-8,11-13 and 26-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on 01/20/2004 has been entered. Claims 1, 2, 6-7, and 11-13 have been amended. Claims 26-28 have been newly added. Claims 3-4; 9-10; 14-25 have been canceled.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-2, 5-8, 11-13, and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xiong et al. U.S. Patent No. 6,434,265 (hereinafter Xiong), and further in view of Shum et al. U.S. Patent No. 6,271,855 (hereinafter Shum) and Teo U.S. Patent No. 6,246,413 (Teo).

4. Claim 1:

(1) Xiong teaches an image synthesis method comprising:

An input step, of inputting a plurality of image data (e.g., column 9, lines 20-30);

A placement information generating step, of generating placement information determined by a placement order of all images inputted in the input step (e.g., column 16, lines 35-45);

A placement information obtaining step of obtaining placement information about a plurality of images in which adjacent images have a common subject region (e.g., in column 4, lines 5-40, Xiong teaches a method for constructing a panorama from rectilinear images in 3D through *projective registration and calibration* including: (1) the projective registrations of overlapping images, (2) calibration and global optimization of these images, a self calibration in which 2D image planes are positioned as 3D planes in space);

A setting step of setting one mapping mode out of a plurality of mapping modes each corresponding to a different mapping surface in accordance with the obtained placement information (e.g., in column 8, lines 18-58 of Xiong, it is stated that "overlapping photographs are analyzed to determine what orientation the photographs were taken in order to establish a common ground for subsequent operations and the panorama is constructed *on a particular geometry* that will *best* facilitate the rendering of the projection of the panorama onto *a chosen viewing plane* for viewing". The Xiong discloses some typical geometry on which panoramas are formed; In column 8, lines 18-58, Xiong further discloses that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection *onto a chosen viewing plane* such as cubic, polyhedral, cylindrical and spherical geometries); and

A synthesis step of combining the plurality of images by using the mapping mode set in the setting step (e.g., in column 4, lines 5-40 of Xiong, it is stated that the composing or blending in which images are ready to be re-projected to a 3D environment map with pixels in overlap regions being composed from multiple; In column 8, lines 18-58, Xiong further teaches that overlapping photographs are analyzed to determine what

orientation the photographs were taken in order to establish a common ground for subsequent operations and the panorama is constructed on a particular geometry that will best facilitate the rendering of the projection of the panorama onto a chosen viewing plane for viewing. The Xiong further discloses some typical geometry on which panoramas are formed);

A changing step, of changing the mapping mode (In column 4, lines 40-50, it is stated that "the projection module may be controlled through the user interface 230 as well, to allow a user to select what geometry will be projected onto". Therefore, Xiong teaches a changing step through the user interface 230 by selecting a geometric surface out of a plurality of geometric surfaces each corresponding to a different mapping surface).

- The Examiner interprets "a placement information obtaining step of obtaining placement information about a plurality of images in which adjacent images have a common subject region" as an automatic registration and calibration step of registering the overlapping images and capturing common overlapping areas between overlapping images and minimizing the average squared pixel intensity difference with respect to certain transformation parameters.
- The Examiner interprets the mapping mode as mapping images onto a geometric surface such as a planar or a cylindrical surface (Applicant's specification, page 1, lines 20-25). Accordingly, the Examiner interprets the setting step of setting a mapping mode as the selecting step of selecting a geometric surface. In column 8, lines 18-58, Xiong discloses that panorama is constructed on a particular

geometry that will best facilitate the rendering of the projection *onto a chosen viewing plane* (a geometric surface) such as cubic, polyhedral, cylindrical and spherical geometries. In column 4, lines 40-50, it is stated that "the projection module may be controlled through the user interface 230 as well, to allow a user to select what geometry will be projected onto". Therefore, Xiong teaches a selecting step of selecting a geometric surface out of a plurality of geometric surfaces each corresponding to a different mapping surface in accordance with the obtained placement information. As applied to the present application, Xiong fulfills the claimed limitation of a setting step of setting one mapping mode out of a plurality of mapping modes each corresponding to a different mapping surface in accordance with said obtained placement information.

(2) However, Xiong does not implicitly teach the claimed limitation of "a generating step, of issuing, when an image formed by changing the mapping mode in the changing step does not comply with a predetermined condition set in accordance with the mapping mode, a warning and generating a synthesized image in accordance with the predetermined condition" in its totality (i.e., generation of a warning message). Xiong does not implicitly teach "a setting step, of *automatically* setting one mapping mode out of a plurality of mapping modes each corresponding to a different mapping surface in accordance with the obtained placement information."

(3) Shum implicitly teaches the claimed limitation of a generating step, of issuing, when an image formed by changing the mapping mode in said changing step does not comply with a predetermined condition set in accordance with the mapping

mode, a warning and generating a synthesized image in accordance with the predetermined condition (Shum abstract; column 18, lines 55-65).

Teo teaches the claim limitation of a setting step, of *automatically* setting one mapping mode out of a plurality of mapping modes each corresponding to a different mapping surface in accordance with the obtained placement information (Teo teaches manipulating (adjusting the scale of the polyhedral surface, rotating the surface, re-positioning edges of the polyhedral surfaces) a polyhedral surface upon which the scene is to be projected, relative to the initial panoramic image, to form a desired surface, wherein the desired surface is distinct from the initial surface and modifying the initial panoramic image by mapping points on the desired surface to corresponding points on the initial surface to produce a modified panoramic image corresponding to projection of the scene onto the desired surface. Teo therefore teaches *automatically* setting a mapping mode by the computer through a user interface);

(4) It would have been obvious to one of ordinary skill in the art to have incorporated the Shum's warning message generation step because Xiong suggests a generating step of generating a synthesized image in accordance with the predetermined condition (Xiong column 3, lines 35-55; column 17, lines 15-67; column 18, lines 1-4). Moreover, Xiong teaches in figures 2 and 3 a user interface and a global optimization that provides feedback to the computer system such as issuing warning messages on the computer monitor 218 when the pair-wise objective function is not desirable for a poor selection of the projection viewing plane (and the resulting panoramas will have imperfectly aligned images that give shadow or ghosting effects) due to a poor selection of the projection viewing plane and the resulting panoramas will have imperfectly aligned

images that give shadow or ghosting effects. Xiong also points to a seamless multi-resolution average blending method that would result in an absent of shadow effects (column 14, lines 1-45). Xiong further teaches a human interaction being present throughout the image synthesis process to provide feedback to the computer system in all the nonlinear optimizations to let users monitor the progress of the system and allow them to intervene when necessary and therefore the claimed limitation suggests an obvious modification of Xiong because providing feedback to users is similar to issuing a message to users in a user interaction with the nonlinear optimizations when the changing step does not comply with a predetermined condition set or user-selected parameter set.

Furthermore, Xiong also teaches a user interface for setting a mapping surface by the computer and therefore Xiong suggests automatically setting a mapping mode.

(5) One having the ordinary skill in the art would have been motivated to do this because this would have provided the user the informative message such as issuing a warning message through the user interaction when convergence to the predetermined condition setting cannot be obtained in the image synthesis (Xiong column 17, lines 15-67, column 18, lines 1-4) for non-solvable optimization problems (Shum column 18, lines 38-67). One having the ordinary skill in the art would have been motivated to do this because setting a mapping mode out from a plurality of mapping mode serves for the purpose of eliminating visible artifacts (Teo column 10).

Claim 2:

Claim 2 recites all the limitations of claim 1 and adds the limitation of "a focal length obtaining step." Xiong teaches finding projective parameters such as 3D rotation

parameters (pan, tilt roll), center of projection of images, ratio of focal lengths, and the like (column 10, lines 9-28). Xiong implicitly teaches finding the camera internal parameters vector of which the focal length is a component (column 11, lines 15-42).

Claim 5:

The claim 5 recites all the limitations of claim 1 and adds the limitation of "a displaying step of displaying a cuttable rectangular region." Xiong teaches how to align images more precisely by changing the coordinates for positioning an image. Xiong further teaches placing the images 1210 at selected tangents on the viewing sphere 1220 (figure 12, and column 17, lines 12-65).

5. Claim 6:

The claim 6 encompasses the same scope of invention as that of claim 1 except additional claimed limitation of "an image synthesis apparatus" and "a displaying step of displaying a cuttable rectangular region". However, Xiong further discloses in figure 3 an apparatus for image synthesis. Xiong teaches how to align images more precisely by changing the coordinates for positioning an image. Xiong further teaches placing the images 1210 at selected tangents on the viewing sphere 1220 (figure 12, and column 17, lines 12-65).

Claim 7:

The claim 7 recites all the limitations of claim 6 and adds the limitation of "a focal length obtaining step." The Xiong reference teaches finding projective parameters such as 3D rotation parameters (pan, tilt roll), center of projection of images, ratio of

focal lengths, and the like (column 10, lines 9-28). Xiong implicitly teaches finding the camera internal parameters vector in his image synthesis apparatus of figure 3 because the focal length is a component of that vector (column 11, lines 15-42).

Claim 8:

The claim 8 recites all the limitations of claim 6 and adds the limitation of "a changing step of changing the mapping mode." Xiong teaches that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection of the panorama onto a chosen viewing plane such as cubic, polyhedral, cylindrical and spherical geometries (column 8, lines 18-58).

6. Claim 11:

The claim 11 encompasses the same scope of invention as that of claim 1 except additional claimed limitation of a computer-readable storage medium having a program for implementing image synthesis method. However, Xiong further discloses the claimed limitation of a computer-readable storage medium having a program for implementing image synthesis method (e.g., in column 3, lines 54-57, it is stated "a program residing in system memory 220 which stores output data and other data").

Claim 12:

The claim 12 recites all the limitations of claim 11 and adds "a focal length obtaining step." Xiong teaches finding projective parameters such as 3D rotation parameters (pan, tilt roll), center of projection of images, ratio of focal lengths, and the like (column 10, lines 9-28). Xiong implicitly teaches finding the camera internal parameters vector of which the focal length is a component (column 11, lines 15-42).

Claim 13:

The claim 13 recites all the limitations of claim 11 and adds the limitation of "a changing step of changing the mapping mode." Xiong teaches that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection of the panorama onto a chosen viewing plane such as one of the cubic, polyhedral, cylindrical and spherical geometries (column 8, lines 18-58).

7. Claim 26:

(1) Xiong teaches an image synthesis method comprising:

An input step, of inputting a plurality of image data (e.g., column 9, lines 20-30);

A placement information generating step, of generating placement information determined by a placement order of all images inputted in the input step (e.g., column 16, lines 35-45);

A placement information obtaining step of obtaining placement information about a plurality of images in which adjacent images have a common subject region (e.g., in column 4, lines 5-40, Xiong teaches a method for constructing a panorama from rectilinear images in 3D through *projective registration and calibration* including: (1) the projective registrations of overlapping images, (2) calibration and global optimization of these images, a self calibration in which 2D image planes are positioned as 3D planes in space);

A setting step of setting one mapping mode out of a plurality of mapping modes each corresponding to a different mapping surface in accordance with the obtained placement information (e.g., in column 8, lines 18-58 of Xiong, it is stated that

"overlapping photographs are analyzed to determine what orientation the photographs were taken in order to establish a common ground for subsequent operations and the panorama is constructed *on a particular geometry* that will *best* facilitate the rendering of the projection of the panorama onto *a chosen viewing plane* for viewing". The Xiong discloses some typical geometry on which panoramas are formed; In column 8, lines 18-58, Xiong further discloses that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection *onto a chosen viewing plane* such as cubic, polyhedral, cylindrical and spherical geometries); and

A synthesis step of combining the plurality of images by using the mapping mode set in the setting step (e.g., in column 4, lines 5-40 of Xiong, it is stated that the composing or blending in which images are ready to be re-projected to a 3D environment map with pixels in overlap regions being composed from multiple; In column 8, lines 18-58, Xiong further teaches that overlapping photographs are analyzed to determine what orientation the photographs were taken in order to establish a common ground for subsequent operations and the panorama is constructed on a particular geometry that will best facilitate the rendering of the projection of the panorama onto a chosen viewing plane for viewing. The Xiong further discloses some typical geometry on which panoramas are formed);

- The Examiner interprets "a placement information obtaining step of obtaining placement information about a plurality of images in which adjacent images have a common subject region" as an automatic registration and calibration step of registering the overlapping images and capturing common overlapping areas

between overlapping images and minimizing the average squared pixel intensity difference with respect to certain transformation parameters.

- The Examiner interprets the mapping mode as mapping images onto a geometric surface such as a planar or a cylindrical surface (Applicant's specification, page 1, lines 20-25). Accordingly, the Examiner interprets the setting step of setting a mapping mode as the selecting step of selecting a geometric surface. In column 8, lines 18-58, Xiong discloses that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection *onto a chosen viewing plane* (a geometric surface) such as cubic, polyhedral, cylindrical and spherical geometries. In column 4, lines 40-50, it is stated that "the projection module may be controlled through the user interface 230 as well, to allow a user to select what geometry will be projected onto". Therefore, Xiong teaches a selecting step of selecting a geometric surface out of a plurality of geometric surfaces each corresponding to a different mapping surface in accordance with the obtained placement information. As applied to the present application, Xiong fulfills the claimed limitation of a setting step of setting one mapping mode out of a plurality of mapping modes each corresponding to a different mapping surface in accordance with said obtained placement information.

(2) However, Xiong does not implicitly teach "a setting step, of *automatically* setting one mapping mode out of a plurality of mapping modes each corresponding to a different mapping surface in accordance with the obtained placement information."

(3) Teo teaches the claim limitation of a setting step, of *automatically* setting one mapping mode out of a plurality of mapping modes each corresponding to a different

mapping surface in accordance with the obtained placement information (Teo teaches manipulating (adjusting the scale of the polyhedral surface, rotating the surface, re-positioning edges of the polyhedral surfaces) a polyhedral surface upon which the scene is to be projected, relative to the initial panoramic image, to form a desired surface, wherein the desired surface is distinct from the initial surface and modifying the initial panoramic image by mapping points on the desired surface to corresponding points on the initial surface to produce a modified panoramic image corresponding to projection of the scene onto the desired surface. Teo therefore teaches *automatically* setting a mapping mode by the computer through a user interface);

(4) It would have been obvious to one of ordinary skill in the art to have incorporated the Teo's automatically setting step because Xiong teaches a user interface for setting a mapping surface by the computer automatically and therefore Xiong suggests *automatically setting a mapping mode*.

(5) One having the ordinary skill in the art would have been motivated to do this because setting a mapping mode out from a plurality of mapping mode serves for the purpose of eliminating visible artifacts (Teo column 10).

8. Claim 27:

The claim 27 encompasses the same scope of invention as that of the claim 26 except additional claim limitation of "a displaying step of displaying a cuttable rectangular region." Xiong teaches how to align images more precisely by changing the coordinates for positioning an image. Xiong further teaches placing the images 1210 at selected tangents on the viewing sphere 1220 (figure 12, and column 17, lines 12-65).

9. Claim 28:

The claim 28 encompasses the same scope of invention as that of claim 26 except additional claimed limitation of a computer-readable storage medium having a program for implementing image synthesis method. However, Xiong further discloses the claimed limitation of a computer-readable storage medium having a program for implementing image synthesis method (e.g., in column 3, lines 54-57, it is stated "a program residing in system memory 220 which stores output data and other data").

Remarks

10. Applicant's arguments, filed 01/20/2004, paper number 12, have been fully considered but they are not deemed to be persuasive.

11. Applicant argues in essence with respect to the amended claim 1 and similar claims that:

> "Furthermore in Xiong et al., each image is synthesized onto a predetermined surface one by one to determine its placement (Xiong et al., col. 15, lines 20-33). Such a step would not enable the method disclosed by Xiong et al. to determine placement information that is determined by the placement order of all images, as taught in Claim 1 of the present invention."

This is not found persuasive for the following reasons:

> Xiong teaches authoring of the panorama to allow manual input to override the computer default ordering (placement order of all images) for the blending of the

images. Images with larger overlaps should be blended onto the panoramic canvas first manually, and can be selected for blending by a user of the present apparatus, through a suitable user interface that lists the images to be blended first in a priority list (placement order of all images). Xiong therefore teaches determining placement information that is determined by the placement order of all images as claimed in Claim 1.

12. Applicant argues in essence with respect to the amended claim 1 and similar claims that:

"*Xiong et al.* is not seen to teach or suggest how to select among plural surfaces, as in Claim 1. In addition, the Office Action at page 4 stages that, according to col. 4, lines 40-50 of *Xiong et al.*, a user can manually select (through a user interface 230) a geometry which will be projected onto. However, Xiong et al. is not seen to teach or suggest automatically setting one mapping mode out of a plurality of mapping modes each corresponding to a different mapping surface in accordance with the obtained placement information, as recited in Claim 1."

This is not found persuasive because of the following reasons:

In column 8, lines 18-58, Xiong discloses that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection *onto a chosen viewing plane* (a geometric surface) such as cubic, polyhedral, cylindrical and spherical geometries. In column 4, lines 40-50, it is stated that "the projection module may be controlled through the user interface 230 as well, to allow a user to select what geometry

will be projected onto". Therefore, Xiong teaches a selecting step of selecting a geometric surface out of a plurality of geometric surfaces each corresponding to a different mapping surface in accordance with the obtained placement information. As applied to the present application, Xiong fulfills the claimed limitation of a setting step of setting one mapping mode out of a plurality of mapping modes each corresponding to a different mapping surface in accordance with said obtained placement information. As to the amended claim limitation of "automatically setting one mapping mode out of a plurality of mapping mode," it is clear that the computer *automatically* setting the mapping surface upon a user selection of a geometric surface. Xiong clearly teaches *automatically* setting the mapping surface out of a plurality of geometric mapping surfaces by the computer through a user selection. Furthermore, Teo teaches selecting among plural surfaces. Teo teaches manipulating (adjusting the scale of the polyhedral surface, rotating the surface, re-positioning edges of the polyhedral surfaces) a polyhedral surface upon which the scene is to be projected, relative to the initial panoramic image, to form *a desired surface*, wherein *the desired surface is distinct from the initial surface* and modifying the initial panoramic image by mapping points on the desired surface to corresponding points on the initial surface to produce a modified panoramic image corresponding to projection of the scene onto the desired surface. Teo therefore teaches *automatically* setting a mapping mode by the computer and selecting among plural surfaces. One having the ordinary skill in the art would have been motivated to do this because setting a mapping mode out from a plurality of mapping mode serves for the purpose of eliminating visible artifacts (Teo column 10).

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jin-Cheng Wang whose telephone number is (703) 605-1213. The examiner can normally be reached on 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Razavi can be reached on (703) 305-4713. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-6606 for regular communications and (703) 308-6606 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 395-3900.

jcw
February 3, 2004

MICHAEL RAZAVI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600